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Appendix 1- MSW data

MSW data Colombo

Colombo MSW rate	1257	ton/day	
Organic (80%)	0.8		
Organic MSW for AD	1005.6	ton/day	
Retention time	15	days	
Digester Volume (Slurry density is 1000kg/m3)	15084	m3	
Continuous type vertical digester is selected			
CH4 emission (assume)	100	m3/ton	
Energy @ 70% CH4	25.2	MJ/m3	
Total heat energy	924950880	MJ/y	
Run hrs per year	8760	hrs/y	
Regulated run hrs @ peak	24	hrs/day	(Scenario)
Reg run hrs	8760	hrs/y	
Electrical efficiency	0.3		
Electrical energy	277485264	MJ/y	
MWe	31676.4	MJ/hrs	
	8.799		
Consider	**8.799**	MW	
Considering PP capacity	10	MW	
Select 2 numbers of 5MW IC Engines			
consider 5% site consumption	439.95	kW	(from 8.799 MW)
Energy site consumption	3853962	kWh/y	
Energy generation	77079240	kWh/y	
Energy supply to grid	73225278	kWh/y	
Considering Tipping fee	500	Rs/ton	
	3.84615385	US$/ton	
Total tipping fee	1764634.62	US$/y	

Fertilizer saving

Fertilizer productin rate assumed as 30 % from OFMSW

	0.3		30%		
Fertilizer	110113.2	ton/y			
	110113200	Kg/y			
Fertilizer Pack	2202264	Nos/y			
Pack price	400	Rs/pack	3.0769231	US $/pack	(contacted Mr.Nimal Premat
Fertilizer revenue	**6776196.9**	us $/y	hilake @ Balangoda tow		0714605460)

CO2 savings

Compared with fossil fuel

Residual oil	0.82	kg/kwh	(from literatures)
Distillate oil	0.76	kg/kwh	
Total kwh from BG plant	77079240	kwh/y	
Saving CO2 kg w.r.t. residual	63204.977	ton/y	63204.98 ton/y
Cost of co2	10	US$/ton	(Certified Emission Reduction in developing countries)
Cost saved w.r.t.residual oil	**632049.77**	US$/y	
Cost saved w.r.t.Diesel oil	**585802.22**	US$/y	

Operating & Maintenance Cost generator	2.5	cent $/kWh/generat	
	1926981	$/generator/y	
O & M of Digester	750000	$/digs/y	(Considered 5% from investment cost)
Considered thumb rule	3	MUS$/MW	
Total capital for 10MW	30000000	US$/MW	

Appendix 2-General Details of the Plant

Cost components of the power plant

Plant Size/MW		Cost of gas Holder		Cost of Civil construction diges		
10	(5*2)	4950000		6750000		
		60% from rest		45%		

Cost of pipeline & appliances	Cost of generators		Total cost		
3300000	15000000	US $		30000000	US $
(40% from balance)	1500	US$/kW			

Economic life 20 years

Assumed Economic Life		Cost sream 10 MW US $
0		30000000
1		8500000.00
2		7950000.00
3		8100000.00
4		7750000.00
5		7850000.00
6		7500000.00
7		7800000.00
8		7400000.00
9		9500000.00
10		7000000.00
11		6800000.00
12		6500000.00
13		6350000.00
14		6470000.00
15		6340000.00
16		6000000.00
17		9680000.00
18		6000000.00
19		6250000.00
20		6050000.00

Appendix 3-Case 1: Considering only electricity as product to earn revenue

Considering FIT as 19.45 Rs/kWh 0.149615385 US$/kWh @ 2011

Assumed 30% is fertilizer from OFMSW feed.

Fertlizer Pack 2202264 pack/y (Pack price is 3.076923077 US$/pack)

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case 1-only electricity sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	30000000.00	0.00	-30000000.00	-30000000.00	-30000000.00	-30000000.00
1	8500000.00	12720262.75	4220262.75	3836602.497	3669793.693	4019297.854
2	7950000.00	12720262.75	4770262.75	3942365.907	3607003.967	4326768.931
3	8100000.00	12720262.75	4620262.75	3471271.786	3037897.754	3991156.676
4	7750000.00	12720262.75	4970262.75	3394756.333	2841763.857	4089047.462
5	7850000.00	12720262.75	4870262.75	3024049.988	2421381.333	3815978.3
6	7500000.00	12720262.75	5220262.75	2946702.229	2256863.643	3895440.436
7	7800000.00	12720262.75	4920262.75	2524872.772	1849709.013	3496738.874
8	7400000.00	12720262.75	5320262.75	2481941.836	1739203.329	3600963.243
9	9500000.00	12720262.75	3220262.75	1365705.762	915399.6558	2075810.079
10	7000000.00	12720262.75	5720262.75	2205408.916	1413961.466	3511745.114
11	6800000.00	12720262.75	5920262.75	2075015.976	1272520.354	3461455.014
12	6500000.00	12720262.75	6220262.75	1981967.405	1162611.583	3463675.048
13	6350000.00	12720262.75	6370262.75	1845238.207	1035345.788	3378286.344
14	6470000.00	12720262.75	6250262.75	1645889.529	883341.2461	3156807.411
15	6340000.00	12720262.75	6380262.75	1527384.174	784099.1058	3069015.472
16	6000000.00	12720262.75	6720262.75	1462524.974	718159.3311	3078629.795
17	9680000.00	12720262.75	3040262.75	601499.7765	282519.1117	1326456.566
18	6000000.00	12720262.75	6720262.75	1208698.326	543031.6303	2792407.977
19	6250000.00	12720262.75	6470262.75	1057939.662	454635.0875	2560502.68
20	6050000.00	12720262.75	6670262.75	991492.0546	407554.9144	2513951.877
NPV				**13591328.11**	**1296795.86**	**35624135.16**

Payback Period @ 10% discount rate

-30000000.00	
-26163397.50	1 years
-22221031.60	2
-18749759.81	3
-15355003.48	4
-12330953.49	5
-9384251.26	6
-6859378.49	7
-4377436.65	8
-3011730.89	9
-806321.97	10
1268694.00	11

Months 4.66 Years 0.388585912

Therefore Payback period **10.39** years

IRR @ 10% for Case 1

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.2
i2	0.1
NPV1	-6115591.70
NPV2	13591328.11

Therefore, IRR 0.16896729

16.8967288 %

20%.
-30000000.00
3516885.622
3312682.463
2673763.164
2396924.55
1957249.368
1748255.432
1373155.032
1237323.076
624108.4944
923854.3692
796796.2382
697643.8616
595389.4665
486811.5008
414113.962
363484.8519
137034.505
252420.0361
202524.8141
173987.489
-6115591.70

Appendix 4-Case 2: Considering electricity + Fertilizer as products to earn revenue

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011

Assumed 30% is fertilizer from feed.

Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case2-only electricity+ Fert

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	30000000.00	0.00	-30000000.00	-30000000.00	-30000000.00	-30000000.00
1	8500000.00	19496459.67	10996459.67	9996781.518	9562138.843	10472818.73
2	7950000.00	19496459.67	11546459.67	9542528.653	8730782.359	10472979.29
3	8100000.00	19496459.67	11396459.67	8562328.828	7493357.225	9844690.353
4	7750000.00	19496459.67	11746459.67	8022990.008	6716076.441	9663841.441
5	7850000.00	19496459.67	11646459.67	7231535.147	5790348.797	9125305.898
6	7500000.00	19496459.67	11996459.67	6771688.737	5186400.569	8951942.911
7	7800000.00	19496459.67	11696459.67	6002133.234	4397132.426	8312455.516
8	7400000.00	19496459.67	12096459.67	5643087.71	3954354.123	8187360.046
9	9500000.00	19496459.67	9996459.67	4239474.738	2841617.738	6443807.034
10	7000000.00	19496459.67	12496459.67	4817926.167	3088933.711	7671742.214
11	6800000.00	19496459.67	12696459.67	4450031.659	2729017.959	7423357.014
12	6500000.00	19496459.67	12996459.67	4141072.572	2429131.239	7236915.048
13	6350000.00	19496459.67	13146459.67	3808061.086	2136667.228	6971848.248
14	6470000.00	19496459.67	13026459.67	3430273.964	1841012.063	6579247.32
15	6340000.00	19496459.67	13156459.67	3149551.843	1616856.338	6328482.052
16	6000000.00	19496459.67	13496459.67	2937222.854	1442296.055	6182883.681
17	9680000.00	19496459.67	9816459.67	1942134.213	912203.2194	4282888.838
18	6000000.00	19496459.67	13496459.67	2427456.904	1090583.028	5608057.76
19	6250000.00	19496459.67	13246459.67	2165902.006	930766.7379	5242073.902
20	6050000.00	19496459.67	13446459.67	1998730.549	821582.4366	5067829.231
NPV				**71280912.39**	**43711258.54**	**120070526.53**

Payback Period @ 10% discount rate

-30000000.00	
-20003218.48	1 years
-10460689.83	2
-1898361.00	3
6124629.01	4
13356164.15	5
20127852.89	6
26129986.12	7
31773073.84	8
36012548.57	9
40830474.74	10
45280506.40	11

Months 2.66 Years 0.221710826

Therefore Payback period **3.22** years

IRR @ 10% for Case 2

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.3
i2	0.4
NPV1	8295141.09
NPV2	-1365369.563

Therefore, IRR 0.38586649

38.5866487 %

Appendix 5-Case 3:Considering Electricity + CO2 as products to earn revenue

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011

Assumed 30% is fertilizer from feed.

Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ CO2

Year	Cost	Revenue	Cash Flow	Dis. CF 10%	Dis. CF 15%.	Dis. CF 5%
0	30000000.00	0.00	-30000000.00	-30000000.00	-30000000.00	-30000000.00
1	8500000.00	13352312.51	4852312.51	4411193.195	4219402.187	4621250.014
2	7950000.00	13352312.51	5402312.51	4464721.087	4084924.397	4900056.703
3	8100000.00	13352312.51	5252312.51	3946140.131	3453480.736	4537145.03
4	7750000.00	13352312.51	5602312.51	3826454.829	3203140.363	4609036.371
5	7850000.00	13352312.51	5502312.51	3416503.167	2735621.773	4311205.832
6	7500000.00	13352312.51	5852312.51	3303477.845	2530116.2	4367085.705
7	7800000.00	13352312.51	5552312.51	2849214.242	2087319.932	3945924.843
8	7400000.00	13352312.51	5952312.51	2776797.718	1945821.52	4028759.405
9	9500000.00	13352312.51	3852312.51	1633756.563	1095067.647	2483234.995
10	7000000.00	13352312.51	6352312.51	2449091.462	1570194.502	3899768.844
11	6800000.00	13352312.51	6552312.51	2296545.564	1408375.168	3831001.423
12	6500000.00	13352312.51	6852312.51	2183357.94	1280746.204	3815624.009
13	6350000.00	13352312.51	7002312.51	2028320.511	1138071.545	3713475.831
14	6470000.00	13352312.51	6882312.51	1812327.987	972667.9916	3476035.494
15	6340000.00	13352312.51	7012312.51	1678691.864	861774.5366	3373042.217
16	6000000.00	13352312.51	7352312.51	1600077.419	785703.184	3368179.076
17	9680000.00	13352312.51	3672312.51	726547.4536	341252.8968	1602217.786
18	6000000.00	13352312.51	7352312.51	1322378.032	594104.487	3055037.711
19	6250000.00	13352312.51	7102312.51	1161284.85	499046.2672	2810626.235
20	6050000.00	13352312.51	7302312.51	1085442.225	446173.3316	2752164.788
NPV				**18972324.08**	**5253004.87**	**43500872.31**

Payback Period @ 10% discount rate

-30000000.00	
-25588806.80	1 years
-21124085.72	2
-17177945.59	3
-13351490.76	4
-9934987.59	5
-6631509.75	6
-3782295.50	7
-1005497.79	8
628258.78	9
3077350.24	10
5373895.80	11

Months 16.35 Years 1.362106962
Therefore Payback period **8.36** years

IRR @ 10% for Case 3

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.15
i2	0.2
NPV1	525300 4.87
NPV2	-303777 4.96

Therefore, IRR 0.1816798
18.16798 %

Appendix 6-Case 4:Considering Electri.+ Fertilizer+CO2 as products to earn revenue

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ Fert+ co2 sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	30000000.00	0.00	-30000000.00	-30000000.00	-30000000.00	-30000000.00
1	8500000.00	20128509.44	11628509.44	10571372.22	10111747.34	11074770.89
2	7950000.00	20128509.44	12178509.44	10064883.83	9208702.789	11046267.06
3	8100000.00	20128509.44	12028509.44	9037197.174	7908940.207	10390678.71
4	7750000.00	20128509.44	12378509.44	8454688.504	7077452.947	10183830.35
5	7850000.00	20128509.44	12278509.44	7623988.325	6104589.237	9620533.43
6	7500000.00	20128509.44	12628509.44	7128464.353	5459653.125	9423588.179
7	7800000.00	20128509.44	12328509.44	6326474.704	4634743.345	8761641.486
8	7400000.00	20128509.44	12728509.44	5937943.592	4160972.314	8615156.208
9	9500000.00	20128509.44	10628509.44	4507525.54	3021285.729	6851231.95
10	7000000.00	20128509.44	13128509.44	5061608.714	3245166.747	8059765.943
11	6800000.00	20128509.44	13328509.44	4671561.247	2864872.773	7792903.423
12	6500000.00	20128509.44	13628509.44	4342463.106	2547265.86	7588864.009
13	6350000.00	20128509.44	13778509.44	3991143.39	2239392.985	7307037.735
14	6470000.00	20128509.44	13658509.44	3596712.422	1930338.809	6898475.403
15	6340000.00	20128509.44	13788509.44	3300859.532	1694531.769	6632508.797
16	6000000.00	20128509.44	14128509.44	3074775.299	1509839.908	6472432.962
17	9680000.00	20128509.44	10448509.44	2067181.89	970937.0046	4558650.058
18	6000000.00	20128509.44	14128509.44	2541136.611	1141655.885	5870687.494
19	6250000.00	20128509.44	13878509.44	2269247.194	975177.9176	5492197.457
20	6050000.00	20128509.44	14078509.44	2092680.72	860200.8537	5306042.142
NPV				**76661908.37**	47667467.54	127947263.69

Payback Period @ 10% discount rate

-30000000.00	
-19428627.78	1 years
-9363743.95	2
-326546.78	3
8128141.73	4
15752130.05	5
22880594.41	6
29207069.11	7
35145012.70	8
39652538.24	9
44714146.95	10
49385708.20	11

Months 0.46 Years 0.038623159
Therefore Payback period **3.04** years

IRR @ 10% for Case 4

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.4
i2	0.45
NPV1	21286.30
NPV2	-319410 9.09

Therefore, IRR 0.40312398
40.3123978 % 23.41566898

Appendix 7-Case 1: sensitivity of +20% investment cost

Sensitivity +20% 36000000
Sensitivity -20% 24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$/kWh @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case 1-only electricity sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	36000000.00	0.00	-36000000.00	-36000000.00	-36000000.00	-36000000.00
1	8500000.00	12720262.75	4220262.75	3836602.497	3669793.693	4019297.854
2	7950000.00	12720262.75	4770262.75	3942365.907	3607003.967	4326768.931
3	8100000.00	12720262.75	4620262.75	3471271.786	3037897.754	3991156.676
4	7750000.00	12720262.75	4970262.75	3394756.333	2841763.857	4089047.462
5	7850000.00	12720262.75	4870262.75	3024049.988	2421381.333	3815978.3
6	7500000.00	12720262.75	5220262.75	2946702.229	2256863.643	3895440.436
7	7800000.00	12720262.75	4920262.75	2524872.772	1849709.013	3496738.874
8	7400000.00	12720262.75	5320262.75	2481941.836	1739203.329	3600963.243
9	9500000.00	12720262.75	3220262.75	1365705.762	915399.6558	2075810.079
10	7000000.00	12720262.75	5720262.75	2205408.916	1413961.466	3511745.114
11	6800000.00	12720262.75	5920262.75	2075015.976	1272520.354	3461455.014
12	6500000.00	12720262.75	6220262.75	1981967.405	1162611.583	3463675.048
13	6350000.00	12720262.75	6370262.75	1845238.207	1035345.788	3378286.344
14	6470000.00	12720262.75	6250262.75	1645889.529	883341.2461	3156807.411
15	6340000.00	12720262.75	6380262.75	1527384.174	784099.1058	3069015.472
16	6000000.00	12720262.75	6720262.75	1462524.974	718159.3311	3078629.795
17	9680000.00	12720262.75	3040262.75	601499.7765	282519.1117	1326456.566
18	6000000.00	12720262.75	6720262.75	1208698.326	543031.6303	2792407.977
19	6250000.00	12720262.75	6470262.75	1057939.662	454635.0875	2560502.68
20	6050000.00	12720262.75	6670262.75	991492.0546	407554.9144	2513951.877
NPV				**7591328.11**	**-4703204.14**	**29624135.16**

Payback Period @ 10% discount rate

-36000000.00	
-32163397.50	1 years
-28221031.60	2
-24749759.81	3
-21355003.48	4
-18330953.49	5
-15384251.26	6
-12859378.49	7
-10377436.65	8
-9011730.89	9
-6806321.97	10
-4731306.00	11
-2749338.59	12
-904100.39	13
741789.14	14
2269173.32	15
3731698.29	16
4333198.07	17
5541896.39	18
6599836.06	19

Months	6.59 Years	0.549308061
Therefore Payback period		**13.54930806** years

IRR @ 10% for Case 1

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.1
i2	0.15
NPV1	7591328.11
NPV2	-4703204.14

Therefore, IRR	0.13087278
	13.0872781 %

Appendix 8-Case 1: sensitivity of -20% investment cost

Sensitivity +20% 36000000
Sensitivity -20% 24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$/kWh @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case 1-only electricity sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	24000000.00	0.00	-24000000.00	-24000000.00	-24000000.00	-24000000.00
1	8500000.00	12720262.75	4220262.75	3836602.497	3669793.693	4019297.854
2	7950000.00	12720262.75	4770262.75	3942365.907	3607003.967	4326768.931
3	8100000.00	12720262.75	4620262.75	3471271.786	3037897.754	3991156.676
4	7750000.00	12720262.75	4970262.75	3394756.333	2841763.857	4089047.462
5	7850000.00	12720262.75	4870262.75	3024049.988	2421381.333	3815978.3
6	7500000.00	12720262.75	5220262.75	2946702.229	2256863.643	3895440.436
7	7800000.00	12720262.75	4920262.75	2524872.772	1849709.013	3496738.874
8	7400000.00	12720262.75	5320262.75	2481941.836	1739203.329	3600963.243
9	9500000.00	12720262.75	3220262.75	1365705.762	915399.6558	2075810.079
10	7000000.00	12720262.75	5720262.75	2205408.916	1413961.466	3511745.114
11	6800000.00	12720262.75	5920262.75	2075015.976	1272520.354	3461455.014
12	6500000.00	12720262.75	6220262.75	1981967.405	1162611.583	3463675.048
13	6350000.00	12720262.75	6370262.75	1845238.207	1035345.788	3378286.344
14	6470000.00	12720262.75	6250262.75	1645889.529	883341.2461	3156807.411
15	6340000.00	12720262.75	6380262.75	1527384.174	784099.1058	3069015.472
16	6000000.00	12720262.75	6720262.75	1462524.974	718159.3311	3078629.795
17	9680000.00	12720262.75	3040262.75	601499.7765	282519.1117	1326456.566
18	6000000.00	12720262.75	6720262.75	1208698.326	543031.6303	2792407.977
19	6250000.00	12720262.75	6470262.75	1057939.662	454635.0875	2560502.68
20	6050000.00	12720262.75	6670262.75	991492.0546	407554.9144	2513951.877
NPV				**19591328.11**	**7296795.86**	**41624135.16**

Payback Period @ 10% discount rate

-24000000.00	
-20163397.50	1 years
-16221031.60	2
-12749759.81	3
-9355003.48	4
-6330953.49	5
-3384251.26	6
-859378.49	7
1622563.35	8
2988269.11	9
5193678.03	10
7268694.00	11

Months 4.16 Years 0.346252469

Therefore Payback period **7.35** years

IRR @ 10% for Case 1

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.15
i2	0.2
NPV1	729679 5.86
NPV2	-115591.70

Therefore, IRR 0.19922028

19.922028 %

Appendix 9-Case 2: sensitivity of +20% investment cost

Sensitivity +20%	36000000
Sensitivity -20%	24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011

Assumed 30% is fertilizer from feed.

Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case2-only electricity+ Fert

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	36000000.00	0.00	-36000000.00	-36000000.00	-36000000.00	-36000000.00
1	8500000.00	19496459.67	10996459.67	9996781.518	9562138.843	10472818.73
2	7950000.00	19496459.67	11546459.67	9542528.653	8730782.359	10472979.29
3	8100000.00	19496459.67	11396459.67	8562328.828	7493357.225	9844690.353
4	7750000.00	19496459.67	11746459.67	8022990.008	6716076.441	9663841.441
5	7850000.00	19496459.67	11646459.67	7231535.147	5790348.797	9125305.898
6	7500000.00	19496459.67	11996459.67	6771688.737	5186400.569	8951942.911
7	7800000.00	19496459.67	11696459.67	6002133.234	4397132.426	8312455.516
8	7400000.00	19496459.67	12096459.67	5643087.71	3954354.123	8187360.046
9	9500000.00	19496459.67	9996459.67	4239474.738	2841617.738	6443807.034
10	7000000.00	19496459.67	12496459.67	4817926.167	3088933.711	7671742.214
11	6800000.00	19496459.67	12696459.67	4450031.659	2729017.959	7423357.014
12	6500000.00	19496459.67	12996459.67	4141072.572	2429131.239	7236915.048
13	6350000.00	19496459.67	13146459.67	3808061.086	2136667.228	6971848.248
14	6470000.00	19496459.67	13026459.67	3430273.964	1841012.063	6579247.32
15	6340000.00	19496459.67	13156459.67	3149551.843	1616856.338	6328482.052
16	6000000.00	19496459.67	13496459.67	2937222.854	1442296.055	6182883.681
17	9680000.00	19496459.67	9816459.67	1942134.213	912203.2194	4282888.838
18	6000000.00	19496459.67	13496459.67	2427456.904	1090583.028	5608057.76
19	6250000.00	19496459.67	13246459.67	2165902.006	930766.7379	5242073.902
20	6050000.00	19496459.67	13446459.67	1998730.549	821582.4366	5067829.231
NPV				**65280912.39**	**37711258.54**	**114070526.53**

Appendix 10-Case 2: sensitivity of -20% investment cost

Sensitivity +20%	36000000
Sensitivity -20%	24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011

Assumed 30% is fertilizer from feed.

Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year
1764634.615	10955628.1	6776196.923	632049.768	20128509.44

Case2-only electricity+ Fert

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	24000000.00	0.00	-24000000.00	-24000000.00	-24000000.00	-24000000.00
1	8500000.00	19496459.67	10996459.67	9996781.518	9562138.843	10472818.73
2	7950000.00	19496459.67	11546459.67	9542528.653	8730782.359	10472979.29
3	8100000.00	19496459.67	11396459.67	8562328.828	7493357.225	9844690.353
4	7750000.00	19496459.67	11746459.67	8022990.008	6716076.441	9663841.441
5	7850000.00	19496459.67	11646459.67	7231535.147	5790348.797	9125305.898
6	7500000.00	19496459.67	11996459.67	6771688.737	5186400.569	8951942.911
7	7800000.00	19496459.67	11696459.67	6002133.234	4397132.426	8312455.516
8	7400000.00	19496459.67	12096459.67	5643087.71	3954354.123	8187360.046
9	9500000.00	19496459.67	9996459.67	4239474.738	2841617.738	6443807.034
10	7000000.00	19496459.67	12496459.67	4817926.167	3088933.711	7671742.214
11	6800000.00	19496459.67	12696459.67	4450031.659	2729017.959	7423357.014
12	6500000.00	19496459.67	12996459.67	4141072.572	2429131.239	7236915.048
13	6350000.00	19496459.67	13146459.67	3808061.086	2136667.228	6971848.248
14	6470000.00	19496459.67	13026459.67	3430273.964	1841012.063	6579247.32
15	6340000.00	19496459.67	13156459.67	3149551.843	1616856.338	6328482.052
16	6000000.00	19496459.67	13496459.67	2937222.854	1442296.055	6182883.681
17	9680000.00	19496459.67	9816459.67	1942134.213	912203.2194	4282888.838
18	6000000.00	19496459.67	13496459.67	2427456.904	1090583.028	5608057.76
19	6250000.00	19496459.67	13246459.67	2165902.006	930766.7379	5242073.902
20	6050000.00	19496459.67	13446459.67	1998730.549	821582.4366	5067829.231
NPV				**77280912.39**	**49711258.54**	**126070526.53**

Payback Period @ 10% discount rate

-24000000.00	
-14003218.48	1 years
-4460689.83	2
4101639.00	3
12124629.01	4
19356164.15	5
26127852.89	6
32129986.12	7
37773073.84	8
42012548.57	9
46830474.74	**10**
51280506.40	**11**

Months 6.25 Years 0.520966891

Therefore Payback period **2.52** years

IRR @ 10% for Case 2

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.45
i2	0.5
NPV1	1402167.97
NPV2	-1181251.74

Therefore, IRR 0.47713783

47.7137828 %

Appendix 11-Case 3: sensitivity of +20% investment cost

Sensitivity +20% 36000000
Sensitivity -20% 24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ Fert+ co2

Year	Cost	Revenue	Cash Flow	Dis. CF 10%	Dis. CF 15%.	Dis. CF 5%
0	36000000.00	0.00	-36000000.00	-36000000.00	-36000000.00	-36000000.00
1	8500000.00	13352312.51	4852312.51	4411193.195	4219402.187	4621250.014
2	7950000.00	13352312.51	5402312.51	4464721.087	4084924.397	4900056.703
3	8100000.00	13352312.51	5252312.51	3946140.131	3453480.736	4537145.03
4	7750000.00	13352312.51	5602312.51	3826454.829	3203140.363	4609036.371
5	7850000.00	13352312.51	5502312.51	3416503.167	2735621.773	4311205.832
6	7500000.00	13352312.51	5852312.51	3303477.845	2530116.2	4367085.705
7	7800000.00	13352312.51	5552312.51	2849214.242	2087319.932	3945924.843
8	7400000.00	13352312.51	5952312.51	2776797.718	1945821.52	4028759.405
9	9500000.00	13352312.51	3852312.51	1633756.563	1095067.647	2483234.995
10	7000000.00	13352312.51	6352312.51	2449091.462	1570194.502	3899768.844
11	6800000.00	13352312.51	6552312.51	2296545.564	1408375.168	3831001.423
12	6500000.00	13352312.51	6852312.51	2183357.94	1280746.204	3815624.009
13	6350000.00	13352312.51	7002312.51	2028320.511	1138071.545	3713475.831
14	6470000.00	13352312.51	6882312.51	1812327.987	972667.9916	3476035.494
15	6340000.00	13352312.51	7012312.51	1678691.864	861774.5366	3373042.217
16	6000000.00	13352312.51	7352312.51	1600077.419	785703.184	3368179.076
17	9680000.00	13352312.51	3672312.51	726547.4536	341252.8968	1602217.786
18	6000000.00	13352312.51	7352312.51	1322378.032	594104.487	3055037.711
19	6250000.00	13352312.51	7102312.51	1161284.85	499046.2672	2810626.235
20	6050000.00	13352312.51	7302312.51	1085442.225	446173.3316	2752164.788
NPV				**12972324.08**	**-746995.13**	**37500872.31**

Payback Period @ 10% discount rate

-36000000.00	
-31588806.80	1 years
-27124085.72	2
-23177945.59	3
-19351490.76	4
-15934987.59	5
-12631509.75	6
-9782295.50	7
-7005497.79	8
-5371741.22	9
-2922649.76	10
-626104.20	11
1557253.74	12
3585574.25	13
5397902.24	14
7076594.11	15

Months 3.44 Years 0.286762049

Therefore Payback period **11.29** years

IRR @ 10% for Case 3

$$IRR = i_1 - NPV_1 * [(i_2 - i_1)/(NPV_2 - NPV_1)]$$

i1	0.1
i2	0.15
NPV1	12972324.08
NPV2	-746995.13

Therefore, IRR 0.14727758

14.7277579 %

Appendix 12-Case 3: sensitivity of -20% investment cost

Sensitivity +20% 36000000
Sensitivity -20% 24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ Fert+ co2

Year	Cost	Revenue	Cash Flow	Dis. CF 10%	Dis. CF 15%.	Dis. CF 5%
0	24000000.00	0.00	-24000000.00	-24000000.00	-24000000.00	-24000000.00
1	8500000.00	13352312.51	4852312.51	4411193.195	4219402.187	4621250.014
2	7950000.00	13352312.51	5402312.51	4464721.087	4084924.397	4900056.703
3	8100000.00	13352312.51	5252312.51	3946140.131	3453480.736	4537145.03
4	7750000.00	13352312.51	5602312.51	3826454.829	3203140.363	4609036.371
5	7850000.00	13352312.51	5502312.51	3416503.167	2735621.773	4311205.832
6	7500000.00	13352312.51	5852312.51	3303477.845	2530116.2	4367085.705
7	7800000.00	13352312.51	5552312.51	2849214.242	2087319.932	3945924.843
8	7400000.00	13352312.51	5952312.51	2776797.718	1945821.52	4028759.405
9	9500000.00	13352312.51	3852312.51	1633756.563	1095067.647	2483234.995
10	7000000.00	13352312.51	6352312.51	2449091.462	1570194.502	3899768.844
11	6800000.00	13352312.51	6552312.51	2296545.564	1408375.168	3831001.423
12	6500000.00	13352312.51	6852312.51	2183357.94	1280746.204	3815624.009
13	6350000.00	13352312.51	7002312.51	2028320.511	1138071.545	3713475.831
14	6470000.00	13352312.51	6882312.51	1812327.987	972667.9916	3476035.494
15	6340000.00	13352312.51	7012312.51	1678691.864	861774.5366	3373042.217
16	6000000.00	13352312.51	7352312.51	1600077.419	785703.184	3368179.076
17	9680000.00	13352312.51	3672312.51	726547.4536	341252.8968	1602217.786
18	6000000.00	13352312.51	7352312.51	1322378.032	594104.487	3055037.711
19	6250000.00	13352312.51	7102312.51	1161284.85	499046.2672	2810626.235
20	6050000.00	13352312.51	7302312.51	1085442.225	446173.3316	2752164.788
NPV				**24972324.08**	**11253004.87**	**49500872.31**

Payback Period @ 10% discount rate

-24000000.00	
-19588806.80	1 years
-15124085.72	2
-11177945.59	3
-7351490.76	4
-3934987.59	5
-631509.75	6
2217704.50	7
4994502.21	8
6628258.78	9
9077350.24	10
11373895.80	11
13557253.74	12
15585574.25	13
17397902.24	14
19076594.11	15

Months 2.66 Years 0.221643475

Therefore Payback period **6.22** years

IRR @ 10% for Case 3

$$IRR = i_1 - NPV_1 * [(i_2 - i_1)/(NPV_2 - NPV_1)]$$

i1	0.2
i2	0.25
NPV1	2962225.04
NPV2	-2400743.87

Therefore, IRR 0.2276174

22.7617399 %

Appendix 13-Case 4: sensitivity of +20% investment cost

Sensitivity +20% 36000000
Sensitivity -20% 24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011
Assumed 30% is fertilizer from feed.
Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ Fert+ co2 sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	36000000.00	0.00	-36000000.00	-36000000.00	-36000000.00	-36000000.00
1	8500000.00	20128509.44	11628509.44	10571372.22	10111747.34	11074770.89
2	7950000.00	20128509.44	12178509.44	10064883.83	9208702.789	11046267.06
3	8100000.00	20128509.44	12028509.44	9037197.174	7908940.207	10390678.71
4	7750000.00	20128509.44	12378509.44	8454688.504	7077452.947	10183830.35
5	7850000.00	20128509.44	12278509.44	7623988.325	6104589.237	9620533.43
6	7500000.00	20128509.44	12628509.44	7128464.353	5459653.125	9423588.179
7	7800000.00	20128509.44	12328509.44	6326474.704	4634743.345	8761641.486
8	7400000.00	20128509.44	12728509.44	5937943.592	4160972.314	8615156.208
9	9500000.00	20128509.44	10628509.44	4507525.54	3021285.729	6851231.95
10	7000000.00	20128509.44	13128509.44	5061608.714	3245166.747	8059765.943
11	6800000.00	20128509.44	13328509.44	4671561.247	2864872.773	7792903.423
12	6500000.00	20128509.44	13628509.44	4342463.106	2547265.86	7588864.009
13	6350000.00	20128509.44	13778509.44	3991143.39	2239392.985	7307037.735
14	6470000.00	20128509.44	13658509.44	3596712.422	1930338.809	6898475.403
15	6340000.00	20128509.44	13788509.44	3300859.532	1694531.769	6632508.797
16	6000000.00	20128509.44	14128509.44	3074775.299	1509839.908	6472432.962
17	9680000.00	20128509.44	10448509.44	2067181.89	970937.0046	4558650.058
18	6000000.00	20128509.44	14128509.44	2541136.611	1141655.885	5870687.494
19	6250000.00	20128509.44	13878509.44	2269247.194	975177.9176	5492197.457
20	6050000.00	20128509.44	14078509.44	2092680.72	860200.8537	5306042.142
NPV				**70661908.37**	41667467.54	121947263.69

Payback Period @ 10% discount rate

-36000000.00	
-25428627.78	1 years
-15363743.95	2
-6326546.78	3
2128141.73	4
9752130.05	5
16880594.41	6
23207069.11	7
29145012.70	8
33652538.24	9
38714146.95	10
43385708.20	11

Months 8.98 Years 0.748288571

Therefore Payback period **3.75** years

IRR @ 10% for Case 4

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.3
i2	0.35
NPV1	4390887.95
NPV2	-1411505.53

Therefore, IRR 0.33783687

33.7836868 %

Appendix 14-Case 4: sensitivity of -20% investment cost

Sensitivity +20%	36000000
Sensitivity -20%	24000000

Considering FIT as 19.45 Rs/kWh 0.149615385 US$ @ 2011

Assumed 30% is fertilizer from feed.

Fertlizer Pack 2202264 pack/y Pack price is 3.076923077 US$/pack

Benefits stream

Tipping Fee	Energy Fee	Fertilizer Fee	CO2 save/resi.o	Total/year	
1764634.615	10955628.1	6776196.923	632049.768	20128509.44	us $/y

Case3-only electricity+ Fert+ co2 sensitivity

year	cost	Revenue	cash flow	Dis CF 10%	15%.	5%
0	24000000.00	0.00	-24000000.00	-24000000.00	-24000000.00	-24000000.00
1	8500000.00	20128509.44	11628509.44	10571372.22	10111747.34	11074770.89
2	7950000.00	20128509.44	12178509.44	10064883.83	9208702.789	11046267.06
3	8100000.00	20128509.44	12028509.44	9037197.174	7908940.207	10390678.71
4	7750000.00	20128509.44	12378509.44	8454688.504	7077452.947	10183830.35
5	7850000.00	20128509.44	12278509.44	7623988.325	6104589.237	9620533.43
6	7500000.00	20128509.44	12628509.44	7128464.353	5459653.125	9423588.179
7	7800000.00	20128509.44	12328509.44	6326474.704	4634743.345	8761641.486
8	7400000.00	20128509.44	12728509.44	5937943.592	4160972.314	8615156.208
9	9500000.00	20128509.44	10628509.44	4507525.54	3021285.729	6851231.95
10	7000000.00	20128509.44	13128509.44	5061608.714	3245166.747	8059765.943
11	6800000.00	20128509.44	13328509.44	4671561.247	2864872.773	7792903.423
12	6500000.00	20128509.44	13628509.44	4342463.106	2547265.86	7588864.009
13	6350000.00	20128509.44	13778509.44	3991143.39	2239392.985	7307037.735
14	6470000.00	20128509.44	13658509.44	3596712.422	1930338.809	6898475.403
15	6340000.00	20128509.44	13788509.44	3300859.532	1694531.769	6632508.797
16	6000000.00	20128509.44	14128509.44	3074775.299	1509839.908	6472432.962
17	9680000.00	20128509.44	10448509.44	2067181.89	970937.0046	4558650.058
18	6000000.00	20128509.44	14128509.44	2541136.611	1141655.885	5870687.494
19	6250000.00	20128509.44	13878509.44	2269247.194	975177.9176	5492197.457
20	6050000.00	20128509.44	14078509.44	2092680.72	860200.8537	5306042.142
NPV				**82661908.37**	53667467.54	133947263.69

Payback Period @ 10% discount rate

-24000000.00	
-13428627.78	1 years
-3363743.95	2
5673453.22	3
14128141.73	4
21752130.05	5
28880594.41	6
35207069.11	7
41145012.70	8
45652538.24	9
50714146.95	10
55385708.20	11

Months 4.47 Years 0.372210973

Therefore Payback period **2.37** years

IRR @ 10% for Case 4

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.5
i2	0.55
NPV1	82467.64
NPV2	-214239.03

Therefore, IRR 0.50185332

50.1853322 %

Payback Period @ 10% discount rate

-36000000.00	
-26003218.48	1 years
-16460689.83	2
-7898361.00	3
124629.01	4
7356164.15	5
14127852.89	6
20129986.12	7
25773073.84	8
30012548.57	9
34830474.74	10
39280506.40	11

Months 11.07 Years 0.922454762

Therefore Payback period **3.92** years

IRR @ 10% for Case 2

$$IRR=i_1-NPV_1*[(i_2-i_1)/(NPV_2-NPV_1)]$$

i1	0.3
i2	0.35
NPV1	229514 1.09
NPV2	-323008 4.73

Therefore, IRR 0.32076966

32.0769659 %